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NOTES ON THE MORPHOLOGY AND BIOLOGY OF *ECTENOPSIS VULPECUA* WIED.  
VAR. *ANGUSTA* MACQ. (DIPTERA, TABANIDAE, PANGONINAE).

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(Eleven Text-figures.)

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*Synopsis.*

The genus *Ectenopsis* was erected by Macquart for *Chrysops vulpecula* Wied. Specimens described under other names by Macquart and Bigot were recorded as synonyms by Ricardo. Ferguson doubted whether they were really synonymous with *E. vulpecula* Wied. The relevant literature is quoted or listed.

Larvae, pupae and imagos of *E. vulpecula* Wied. var. *angusta* Macq. were found at Woolwich, Sydney, N.S.W. Larva and pupa are described and figured.

*Introduction.*

The genus *Ectenopsis* was erected by Macquart (1838) for *Chrysops vulpecula* Wied. (1828), a Tabanid, whose country was unknown, in the Berlin Museum. Walker (1848) in his List of the Specimens of Dipterous Insects in the Collection of the British Museum, lists "*Ectenopsis vulpecula* Macq., *Chrysops vulpecula* Wied.", with references, and a question mark for the country of origin. Macquart (1847) described *Pangonia angusta*, from Nouvelle-Hollande, in the collection of M. Bigot. Bigot (1892) described *Corizoneura angusta* and *C. rubiginosa*, from Australia, in his own collection. Ricardo (1915) recorded the synonymy of the above three species with *E. vulpecula* Wied. the type of the genus. Ferguson (1921) agreed that the three species were the same but doubted whether they were really synonymous with *E. vulpecula* Wied. He says: "I have not seen Wiedemann's original description, but apparently the name was applied to a species with black legs. I have taken a species at Sydney which has the legs, except the coxae, deep black, the wings are also smoky, almost deep black in fresh specimens, but fading somewhat with age, the palpi variable in colour, black to testaceous. Compared with this . . . are specimens in which the legs are yellowish (testaceous) and the wings clear, the stigma being inconspicuous in marked contrast to the black stigma of the other form.

"While I recognise that the species may prove sufficiently variable to include the two forms, I think that at any rate varietal names should be given to each. *E. vulpecula* Wied. evidently from all evidence, should be applied to the black legged form. . . . *E. angusta*, Macq. (= *E. angusta*, Bigot and *E. rubiginosa*, Big.) would apply to the paler legged form."

From this it can be seen that, over the years, there has been some confusion about the naming of the species and some doubt whether the specimens described belonged to one variable species or possibly to two distinct species.

The material which forms the subject of this paper includes thirteen imagos collected during one summer in a very small area at Woolwich, Sydney, N.S.W. The adults are the pale-legged form, though even among these few there is some variation in colour, none have wholly black legs, and the stigma of the wing is inconspicuous.

Adults were sent to Dr. I. M. Mackerras, who said: "The Pangonines are undoubtedly *Ectenopsis vulpecula* Wied. var. *angusta* Macq. as identified in the Ferguson collection."

Some were sent also to Mr. H. Oldroyd for comparison with Bigot's types of *rubiginosa* ♂ and *angusta* ♀ which are in the British Museum, where they are all under the one name *Ectenopsis vulpecula* Wied. "as placed by Miss Ricardo".

However, as it appears possible that two species may exist, the varietal name is used for these specimens.

## OCCURRENCE.

Larvae and adults were collected at Woolwich, Sydney, N.S.W., in 1949-1950.

A larva was found on 27th November, 1949; it pupated next day, and a female emerged on 17th December. This is the only specimen for which larval and pupal exuviae were obtained. On 4th December a female was found on leaves a few inches from the ground. It had just emerged, and on the soil below it was the pupal exuvia.

In December, 1949, and January, 1950, thirteen adults, nine males and four females, were collected on foliage near where the first larva was found. They were always resting on leaves when taken, so it was not determined what flowers they visited.

In September-October-November, 1950, twenty-seven larvae and one pupa were found in the soil. Two of the larvae pupated, but these and the collected pupa failed to emerge. Of the remaining larvae some were killed and preserved, some died, and eight were still alive in June, 1952, twenty to twenty-two months after being collected.

Larvae, pupae and adults were all collected in a very small area where shrubs, citrus trees and cannas had been planted years before. The soil was a black sandy loam, usually quite moist, as there was some soakage from a sandstone ledge above, but the ground was well drained and was not at all swampy. The larvae were within a few inches of the surface of the soil, some amongst the canna roots and some in the shade of a citrus tree. No eggs were found.

## LARVA. (Text-figs. 1-8.)

The larva is white in colour, the skin shining and longitudinally striated; the striations are slightly coarser on the thorax and last abdominal segments than on the abdominal segments 1-7. The living larva is noticeably widest on the metathorax and narrowest on the seventh abdominal segment, a characteristic which tends to be lost in preserved specimens. One larva, alive but contracted, was about 23 mm. long and about 2.5 mm. in breadth across the meta-thorax, tapering to 1.5 mm. across the seventh abdominal segment; another larva, killed and preserved, was 25 mm. in length. The pro-thorax (Text-fig. 2) tapers sharply to the very small head. The abdomen tapers very gradually to the last segment (Text-fig. 3) which is rounded posteriorly, with four small pointed terminal processes surrounding the spiracular area, and one small pointed process above the posterior spiracle; these processes are just visible to the naked eye. The larva is cylindrical in shape, not flattened at all.

*Head:* The head can be, and frequently is, completely withdrawn; in freshly killed specimens it can be seen through the integument, and the anterior tips of the mandibles lie just forward of the middle of the meso-thorax. The head capsule is very slender, one being 3.5 mm. long,  $\frac{1}{2}$  mm. wide and a little less than  $\frac{1}{2}$  mm. high; it is composed of pale chitin with dark red-brown mandibles and tentorial rods (Text-fig. 5), and dark brown parts of the epicranium; the pharynx (Text-fig. 4) is also heavily chitinized. Eye spots are not evident.

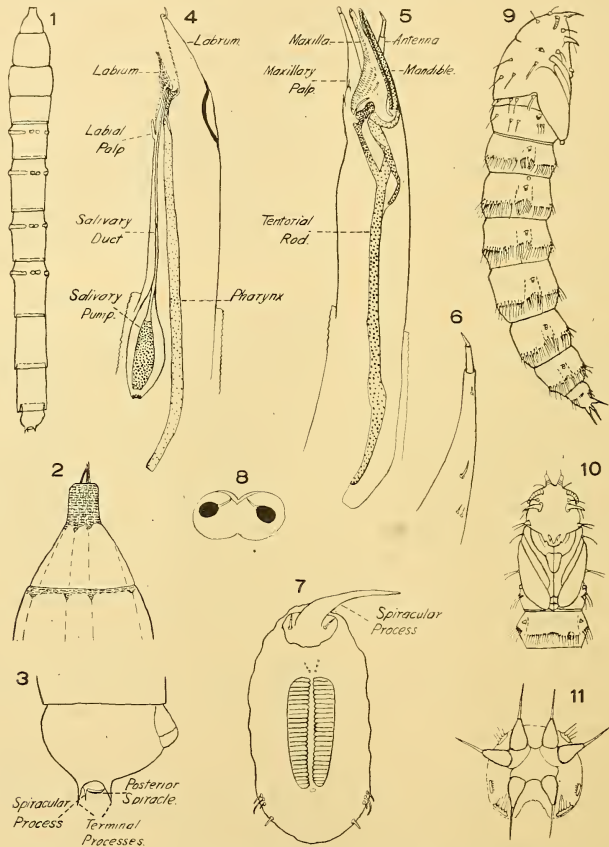
The *antennae* (Text-fig. 6) are three-segmented: the basal segment, broad at the base, long and tapering, is furnished with four very small flexible processes; the second segment is short and slender; the third segment is less than half the length of the second, and tapers to a point on which may be a minute pointed process.

*Mouth-parts:* The heavily chitinized mandibles (Text-fig. 5) are very long and slender, and have the characteristic longitudinal canal opening on to the anterior dorsal surface, but they lack the serrations on the lower edge that occur in *Tabanus*. The maxillae are longer than the mandibles, and are thickened at the apex and along the lower edge to form a groove into which the mandible fits; they are wide at the base and taper sharply to the slender distal half; they are not heavily chitinized and appear quite transparent, and are apparently very flexible as the distal half frequently folds backwards when being mounted in balsam; on the thickened lower edge are numerous fine hairs and minute teeth, and on the wide basal part are irregular rows of minute teeth.

The *maxillary palp* (Text-fig. 5) is three-segmented. The basal segment is short and broad with a long spine on the ventral distal edge, a smaller spine just behind it, and several minute spines on the lateral surface. The second segment is very long and

tapers gradually to the short third segment which has a rounded end furnished with minute papillae.

The *labrum* (Text-fig. 4) is chitinized but is of a pale colour. It is long and slender with two slender curved spines on the dorsal surface near the apex; the ventral surface is furnished, on the edges, with fine hairs. Other very small structures occur on the



Text-figures 1-11. *Ectenopsis vulpecula* Wied. var. *angusta* Macq.

1. Larva, lateral view,  $\times 3$  approx.—2. Larva, anterior end, lateral view,  $\times 12$  approx.—3. Larva, posterior end, lateral view,  $\times 12$  approx.—4, 5. Mouth parts of larva, longitudinal section,  $\times 27$  approx.—6. Antennae of larva,  $\times 64$  approx.—7. Spiracular area and posterior spiracle of larva,  $\times 12$  approx.—8. Graber's organ of larva,  $\times 120$  approx.—9. Pupa, lateral view,  $\times 4$  approx.—10. Anterior end of pupa, ventral view,  $\times 4$  approx.—11. Posterior end of pupa, end view,  $\times 16$  approx.

labrum also. The labium is about half the length of the labrum; it tapers sharply to a point and is covered with rows of fine hairs; there is a pair of labial palps on the ventral posterior portion, and the salivary duct runs back from the labium to the large salivary pump.



*Thorax:* The pro-thorax (Text-fig. 2) is encircled anteriorly by a wide collar, or annulus, of skin with a network pattern of longitudinal and transverse lines, the latter being armed with minute backwardly-directed spines; this part of the prothorax can be completely retracted. At the anterior edge of both meso- and meta-thorax is a very narrow band of skin similarly marked and armed. Near the posterior edge of the prothorax, one on each side, are the minute unchitinized slit-like openings for the anterior spiracles. On each thoracic segment, on the ventral surface, are two groups of fine hairs, one group on each side of the middle line; the hairs are very small and to be seen a magnification of at least 100 is required.

*Abdomen:* On segments 2 to 5, towards the anterior border of each, is a circlet of more or less prominent pseudopods: a ventral pair, more or less rounded and fairly prominent, a lateral pair on each side very similar to the ventral ones, and a dorsal pair, very slightly raised, elongated, and meeting on the dorsum. Pseudopodia are present also on segments 6 and 7 but they are very much reduced. The longitudinal striations of the abdomen are broken up on the pseudopodia by transverse lines forming a network pattern; these areas do not appear to have spines or hairs on them. Segment 8 (Text-fig. 3) appears rounded like a ball when the larva is moving. On the ventral surface is the anus bordered by prominent folds of skin; posteriorly the segment is produced into four pointed terminal processes round the spiracular area.

The posterior spiracle (Text-fig. 7), with bars of heavier chitin, is of the typical Tabanid form; it emerges from a vertical slit in the spiracular area and protrudes very slightly. The spiracular area is approximately an oval and the striations on the area more or less follow the same shape. At the dorsal edge of the area, above the spiracle, is a single finger-like process with a very small process on each side at the base. Ventrally, near the outer edge of the area on each side is a group of three small processes and below them and nearer the edge is a single process; these can be seen in mounted specimens with a magnification of about 185. Immediately above the spiracle is a group of small mounds.

Graber's organ (Text-fig. 8) is not visible in the living larva. In mounted specimens of larva that have died or been killed, only two black bodies have been seen. Similarly only two black bodies are to be seen in the slide of the last larval exuvia of the only specimen that was reared from a larva.

#### PUPA. (Text-figs. 9-11.)

The pupal exuviae obtained are approximately 18 mm. in length; one pupa which failed to emerge, and was preserved in good condition, is about 20 mm. long and 3.5 mm. broad on the thorax. The head and thorax are armed with thorns and slender spines. On the head are two pairs of strong thorns, one pair anterior to the eyes and one pair below the eyes, which are broad at the base and terminate in a fine point; on each of the second pair is a long thin spine placed about midway on its posterior surface. There are two pairs of spines above the anterior thorns and another pair between the two pairs of thorns, each spine set on a prominent small tubercle; posterior to the second pair of thorns, on each side, is a tubercle bearing two spines. On the ventral surface, at each side of the apex of the sheath of the labrum is a short thorn.

The thorax bears three pairs of spines on the dorsal surface, each on a tubercle; and at the base of each wing, on a single tubercle, is a pair of alar spines which are frequently so close together as to appear as one spine. The thoracic spiracle is prominent. The meta-thorax bears, on each side, a pair of lateral spines on one tubercle, and three dorsal spines.

On the first abdominal segment, on each side, are three lateral spines close together just posterior to the prominent spiracle, and three dorsal spines. Abdominal segments 2-7 bear a small spiracle on each side, and a girdle of spines towards the posterior border of each segment. On segment 2 the spines are more or less in a single line, but on each succeeding segment there are more spines in a second line until on segment 7 there are two irregular rows of spines forming the girdle. The last segment bears three